AUDIO VISUAL COMMUNICATION REVIEW

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RELATIONSHIP BETWEEN LEARNING AND THE PERCEIVED USEFULNESS OF A FILM[1]

• LESLIE GREENHILL

• MALCOLM McNIVEN

This study is the culmination of several attempts by the Instructional Film Research Program to develop a measure of one of the aspects of motivation important to learning from films. Leslie Greenhill is associate director of the IFRP at The Pennsylvania State University. Malcolm McNiven, formerly with IFRP, is now in the overseas teaching program of the University of Maryland.

INTRODUCTION

The General Problem

The individual in a learning situation is subjected to many types of teaching materials and techniques. He is exposed to various phases of instruction, each of which presents him with a variety of information to be learned and ultimately used by him. The effectiveness of these learning situations is determined by (a) the nature of the teaching materials and method of presentation, (b) the physical environment in which the subject is being taught, and (c) the intelligence, aptitude, and motivation of the individual to learn the material presented. A great deal is known relative to the effects of the teaching stimuli and the physical environment on learning, and intelligence tests and aptitude tests enable the experimenter to determine the relation of these particular variables to learning; but the precise effects of varied motivation and the nature of the factors which are denoted by the term "motivation" are relatively undetermined, so far as human learning is concerned.

It is generally assumed that motivation is closely related to learning and that increased motivation (up to a certain point) will

[1] The research on which this article is based was sponsored by the Special Devices Center, Office of Naval Research, under Contract N6onr-269. Reproduction in whole or in part is permitted for any purpose of the United States Government.

result in increased learning, other things being equal. This is such a commonly accepted principle in educational theory that its very statement has prevented a critical evaluation of the specific hypotheses to which the principle logically leads. The obvious weaknesses of such a principle are: (a) that human motivation has not been adequately defined and the specific factors of which it is composed have not been isolated, and (b) this lack of definition has resulted in a lack of adequate measures in the field of human motivation.

Human motivation is a complex term used to represent all types of urges, drives, sets, and such, which the individual exhibits in his behavior from time to time. It is not enough to know merely that motivation exists; it is very important to know what factors make up the force known as "motivation" so that it will be possible to isolate these various components and devise objective measures of them in order to study their effects on learning. It is because of the lack of experimental work in this area that there is relatively little evidence to indicate exactly what does determine an individual's motivation to learn. The explanations of various types of learning are usually based on the concept of reward and reinforcement at the time or near the time of the actual learning. The question then arises, "What are the rewards of academic learning or learning in a training situation, and when are the learners reinforced?" It is necessary, therefore, to determine what factors relate to an individual's perception of the rewards of learning certain material.

An analysis of the various learning theories and experimental work in this area indicated that the variable of *perceived goal distance* was extremely important in animal learning and it was suggested that this might also be true of human learning.[2] Hull proposed that the nearer the learner approaches to the goal, the stronger will be its response-evoking power.[3] Lewin proposed that the force with which an individual attacks a learning situation is inversely proportional to the distance between the learning situation and the goal (the expected use of the material learned as perceived by the learner).[4] These two statements differ on the grounds of their respective definitions of "distance." Hull considers perceived goal

[2] Perceived goal distance, as applied to humans, is defined as the learner's perception of the "distance" which exists between the learning of a particular body of information and the actual use of that information. Of course, this variable is only one of the many which are considered to be motivational variables, e.g., interest motive, achievement motive, curiosity motive, etc.

[3] Hull, C. L., "The Goal Gradiant Hypothesis and Maze Learning." *Psychological Review* 38:25-43 : 1932.

[4] Lewin, K. *Dynamic Theory of Personality.* New York: McGraw-Hill, 1935.

distance to be conceived in physical units, such as time or space, while Lewin considers perceived goal distance to be conceived in psychological terms where no physical unit of measurement is implied, only intervening psychological fields.

Both of the above approaches emphasize the point that distance depends upon the perceptions of the individual and that these vary considerably from one individual to another. It was important to test both these concepts of goal distance and to determine their effects on learning and attitudes toward learning. In order to achieve this, two types of experimental conditions were employed—one varying temporal goal distance (distance from learning of material to use of material expressed in units of time) and the other varying psychological goal distance (the relative usefulness of the material *as perceived by the learner*).

The Problems for This Study

The problems selected for study here were (a) to show to what extent either or both types of goal distance are factors involved in motivation to learn, and what effect this has upon actual learning, and (b) to develop a measure of perceived goal distance and to show its relationship to learning scores. This latter task was accomplished by developing a Guttman-type scale of attitudinal items designed to measure the learner's attitude toward the usefulness of the material to be learned.

The general hypothesis to be tested was stated as follows: *The nearer the individual perceives himself to be to the use of the information contained in a communication, the greater will be his learning from that communication, other things being equal.*

MATERIALS AND PROCEDURES

The Films

The task selected for the study was learning from instructional films. Three films were chosen for use in the experiment:

	Title	*Producer*	*Time*
1.	*Help Wanted*	Johnson and Johnson	19 minutes
2.	*Atomic Energy*	ERPI	14 minutes
3.	*Know Your Car*	U.S.E.S.	11 minutes

A brief summary of each film follows:

Help Wanted. This film shows the basic principles of first aid and the general procedure of caring for the victim before the doctor

arrives. It shows the circulatory system of the human body, methods of stopping bleeding from cut arteries and veins, treatment of shock, proper methods of applying and handling various types of bandages, treatment of burns and fractures, and methods of transporting the injured.

Atomic Energy. This film deals with the structure of the atom and the principles of atomic research. It shows, by animation, the process of nuclear synthesis, nuclear fission, chain reaction, and other phases of the release of atomic energy. The release of radiant energy is shown in its relation to the atomic reaction.

Know Your Car. This film explains the fundamental parts of a car and the functions of these parts. The film covers the construction of the car chassis; how the engine converts gasoline into power; the functions of the clutch, transmission, and rear axle; how the brakes stop the car; how the electrical and cooling systems function; and what the gauges on the instrument panel indicate.

All films were 16 mm black and white sound motion pictures.

Subjects

The subjects for the main testing were seniors at the William Penn High School in York, Pennsylvania. These included 473 seniors from every curriculum who were assigned to the experimental groups at random.

Measuring Instruments

Three types of measures were used: (a) Information tests, (b) a ranking and rating form, and (c) an attitude scale (see Appendix).

Information tests. Information tests consisting of standard four-choice questions were constructed from the films. The questions were obtained mainly from the film sound track, but also from the visual portion of the film if the information was presented essentially that way. No information was tested that was not included in the films. Due to the restrictions of time available for testing, the tests were not as long as would have been desirable (39 items each). The shortness of the tests naturally affected the reliability estimates for the tests. (The reliabilities ranged from .67 to .86.[5]) The same tests were used for pretesting and post-testing.

[5] Reliabilities were computed by Kuder-Richardson formula 21.

Ranking and rating form. The ranking form consisted of the short descriptions of the three films (as given above) and a place where the subject could indicate his ranking of the films in order of their estimated usefulness to him. Also included on this form were two rating scales for each film summary. The subject was to rate each film on the basis of (a) its expected *use* value and (b) its expected *interest* value to him. These ratings were used to supply an indication of the basis upon which the subjects were ranking the films.

Attitude scale. The attitude scale to measure the perceived usefulness of the material in the films included 10 items, each consisting of an incomplete statement and six responses which would complete the statement. These statements were selected from approximately 50 statements which were originally written to cover the many facets of the subject of the scale.[6] On the basis of inspection of these items by several judges, the number of items was reduced to 16. Then, using data acquired during a pilot test, the method of Guttman scaling[7] was used to obtain the final scale of 10 items.[8] The coefficients of reproducibility ranged from .89 to .93 for the five experimental groups.

Experimental Procedures

Temporal goal distance. Temporal goal distance was varied by informing the subjects of a realistic situation in which they would be required to demonstrate their knowledge of the subject matter in the film to be seen by them (*Help Wanted*). Three groups were given different information regarding the span of time which would lapse between when they saw the film and when they were to be performance tested on the information in the film. Groups 1, 4, and 5 were used for this phase of the experiment and they all saw the same film (*Help Wanted*). Group 1 was given no specific information regarding any use of the film information, Group 4 was told they would be asked to demonstrate their knowledge of first aid before the end of the spring semester (2 months), and Group 5

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[6] Many of these statements were drawn from an earlier scale developed by Greenhill, L. P., of the Instructional Film Research Program.

[7] For a description of Guttman scale analysis, see Stauffer, S. A.; Guttman, L.; Suchman, E. A.; Lazarsfeld, P. F.; Star, S. A.; and Clausen, J. A.; *Measurement and Prediction*, Princeton, N. J.: Princeton University Press, 1950.

[8] Details of the scoring and scaling procedure used in this study are given in McNiven, M. A. *Human Learning and Attitude Toward Learning as a Function of Perceived Goal Distance.* Unpublished Ph.D. dissertation. The Pennsylvania State University, June 1955.

was told they would have to demonstrate their knowledge of first aid the following day by taking an actual performance test.[9]

Psychological goal distance. Psychological goal distance was varied by allowing three groups (Groups 1, 2, and 3) to rank the three films in order of the perceived usefulness of the films to them as estimated from brief verbal descriptions of the film contents. Each subject was then assigned to a certain film group *regardless* of his choice of film; consequently, there were subjects in each group who had ranked the film first, some who had ranked it second, and some third. These individuals, therefore, differed on the basis of the perceived usefulness of the material in the film which they actually saw, i.e., the person who ranked a film first perceived a shorter psychological distance to the use of the material in that film than did a person who ranked the film third.

The experimental procedures for the five groups are set out below:

Group 1	Group 2	Group 3
Ranking Sheet	Ranking Sheet	Ranking Sheet
Pretest 1	Pretest 2	Pretest 3
Film 1 *(Help Wanted)*	Film 2 *(Atomic Energy)*	Film 3 *(Know Your Car)*
Attitude Scale	Attitude Scale	Attitude Scale
Post-test 1	Post-test 2	Post-test 3
Otis IQ test	Otis IQ test	Otis IQ test

Group 4

Ranking Sheet
Pretest 1
Directions for Use
Film 1 *(Help Wanted)*
Attitude Scale
Post-test 1
Otis IQ test

Group 5

Ranking Sheet
Pretest 1
Directions for Use
Film 1 *(Help Wanted)*
Attitude Scale
Post-test 1
Otis IQ test

RESULTS AND DISCUSSION

Analysis of Groups 1, 2, and 3 (Psychological Goal Distance)

The analysis for this portion of the study involved five variables designated as:

[9] A sample from each of the three groups was given a performance test on the basic techniques of first aid on the day following the experiment. The data from this performance test were not used in any comparison groups.

1. Attitude scale scores
2. Post-test scores
3. Pretest scores
4. Otis Mental Abilities Test Score
5. Film ranks.

When post-test score was one of the variables involved in a correlation, a second-order partial correlation was computed with the pretest score and IQ score partialled out.

TABLE 1—CORRELATIONAL ANALYSES FOR GROUPS 1, 2, AND 3
(Psychological Goal Distance)

	GROUP		
	1	2	3
Correlation	*(Help Wanted)*	*(Atomic Energy)*	*(Know Your Car)*
N	70	109	105
$r_{12.34}$	—.03	.36†	.34†
$r_{52.34}$	—.22*	—.20*	—.24†
r_{15}	—.36†	—.45†	—.43†
r_{24}	.67†	.65†	.38†
r_{14}	—.01	.33†	—.17

* = significant at the 5% level
† = significant at the 1% level
1 = attitude scale scores
2 = post-test scores
3 = pretest scores
4 = Otis Mental Abilities test score
5 = Film ranks

It can be seen from Table 1 that for two of the three films the second-order partial correlations between the attitude scale scores (perceived usefulness) and post-test scores (learning) ($r_{12.34}$) are significant at the 1 percent level. For the third film the partial correlation was close to zero.

The second-order partial correlations between the subjects' rankings of the films and their score on the post-tests are shown in Table 1 ($r_{52.34}$). These are all significant at the 5 percent level and one is significant at the 1 percent level. The negative sign is a result of the scoring procedure whereby the ranks scored with one were the highest ranks and three the lowest. On the other hand, the post-test scores were arrived at in the usual manner with a high numerical score being scored as high, thus the negative correlation is in the direction predicted, i.e., the individual who saw the film he ranked first or highest learned relatively more than the person who saw the film he ranked third or lowest. This was

predicted on the basis of the effect of the perceived personal relevance of a learning situation on the learning while in that situation.

The zero order correlations between attitude scale scores and film ranks are also shown in Table 1 (r15). These correlations, which are all significant at the 1 percent level, indicate the degree of relationship between the film rankings and the attitude scale scores. Since these two measures were designed to measure somewhat the same variable, one would expect a correlation of this magnitude between the two. A possible reason why the correlations are not higher may be due to the fact that the rankings were based on short descriptions of the films before the subjects saw the films, while the attitude scale responses were based on the contents of the films after seeing them. The relationships between post-test scores and intelligence (Otis) and attitude scale scores and intelligence are also shown.

Analysis of Groups 1, 4, and 5 (Temporal Goal Distance)

The analysis of variance was used to test for differences between the means of Groups 1, 4, and 5 on the attitude scale (perceived usefulness of contents of film *Help Wanted*).

TABLE 2—ANALYSIS OF VARIANCE OF GROUPS 1, 4, AND 5 ON ATTITUDE SCALE SCORES

	SS	d.f.	MS	F
Between Groups	67	2	33.5	1.52
Within Groups	4363	197	22.1	
Total	4430	199		

The F ratio is not significant in this analysis, indicating that the groups were not significantly different with respect to their attitude toward the usefulness of the film's contents.

The analysis of the means of post-test scores was accomplished by using the analysis of covariance. The matching variables of Otis Intelligence scores and pretest scores were used to equate the subjects on IQ and previous experience with the material to be learned. The variances of the groups were tested for homogeneity by Bartlett's method. The analysis of covariance is shown in Table 3; the adjusted means are shown in Table 4.

TABLE 3—ANALYSIS OF COVARIANCE OF POST-TEST SCORES FOR GROUPS 1, 4, AND 5, WITH OTIS SCORES AND PRETEST SCORES AS MATCHING VARIABLES

SOURCE	SS	$1-R^2$	SS $(1-R^2)$	d. f.	MS	F
Between Groups	60		207.1504	2	103.575	9.30**
Within Groups	4066	.5368	2182.6288	196	11.136	
Total	4126	.5792	2389.7792	198		

** Indicates significant at 1 percent level

TABLE 4—MEANS AND ADJUSTED MEANS OF POST-TEST SCORES FOR GROUPS 1, 4, AND 5 (ADJUSTED FOR OTIS AND PRETEST SCORES)

Time Before Application of Material	GROUP 1 Indefinite	4 Up to Two Months	5 One Day
N	70	63	67
Post-Test Means	30.51	31.81	31.45
Adjusted Means	29.83	31.90	32.08

The preceding analyses of Groups 1, 4, and 5 indicate that there were no significant differences on attitude scale scores among the three groups which had different instructions regarding the time when they would use the material in the film (Table 2). This is a rather unexpected finding since the groups were given instructions about when they would be tested so as to differentiate them on a variable (temporal distance) thought to be similar to that measured by the attitude scale (psychological distance). This may have been due to the fact that, when seeing this particular film (the first aid film), the distribution of responses to the scale items was skewed in the favorable direction so that there was somewhat of a "ceiling effect" in operation, i.e., there were not enough extremely positive items to allow an individual who was already favorable to move up the scale. This would have resulted in small differences among the groups, but differences not representative of the true differences which existed.

Also indicated by the preceding analyses (Table 3) is the fact that there were significant differences among the three groups on post-test scores when intelligence scores and pretest scores were held constant. These differences are in the predicted direction (Table 4) and, although they appear to be rather small differences, nevertheless they are statistically significant. It can be stated with a fair degree of confidence that these differences are a result of the experimental treatments imposed upon the three groups.

The Attitude Scale As a Measure of Perceived Goal Distance

The attitude scale, as described previously, was constructed with two purposes in mind: (a) to measure the variable called perceived goal distance (perceived usefulness of the material or perceived relevance of the material to the learner) so that comparisons could be made with other variables, and (b) to be used as a standard measure in any learning or training situation to determine the perceived usefulness of the material taught from the learner's point of view rather than from the teacher's point of view.

The measure was successful in fulfilling the first purpose since it correlated rather well with the film rankings, since it had such high coefficients of reproducibility, and since the variable it measured acted in such a way as to support the hypotheses, which were arrived at logically. It also fulfilled the first purpose since it met the criteria for any good measure of motivation—it correlated highly with learning and low with intelligence (Table 1).

The measure appeared to fulfill the second purpose also since it was used in four different high schools at two different periods (a month apart) with reference to three extremely different films and it met the criteria for scalability in every case with almost the same coefficients of reproducibility and with the same category combinations. Recently, the scale was modified slightly to apply to a college course rather than a film viewing situation. It was used in a study by the Instructional Film Research Program to compare a class taught by television and a class taught by the usual face-to-face method. The results were most gratifying since the scale had a high coefficient of reproducibility, although the category combinations were found to be somewhat different to obtain the best discrimination of respondents. If the original category combinations were used, the scale still met the criteria for scalability, but not at as high a level of acceptability.

On the basis of these results, it is not inconceivable that, by testing this scale on many varied populations and in other teaching situations, it may be found to have a wide degree of generality. It should be pointed out that if the scale is used in other situations it should be tested for scalability before the results are used as meaningful data.

CONCLUSIONS

1. The nearer an individual perceives himself to be to the use of the information contained in a film, the greater will be his learning from that film.

2. It was possible to construct a reliable scale of perceived psychological goal distance (perceived usefulness) which met the criteria of scalability for different populations, and for various learning situations at different times.

The implications of the results of this study for practical applications are promising. The fact that perceived usefulness is a factor affecting human learning, and that the scale constructed here

appears to be a reliable and valid measure of this aspect of motivation, provides the instructor and researcher with information of value in their attempt to predict, determine, control, and increase the motivation of their students or subjects.

The researcher who is interested in controlling motivation in his experimental groups may find the scale of perceived goal distance to be a valuable matching variable. The scale should be tested for scalability when used on a population other than that used in this study. It should not be assumed that the scale measures motivation in its entirety, for it measures only one of a complex of variables which compose the general concept called "motivation."

Instructors and other users of films should be interested in the results of this study since they indicate that the extent to which an individual perceives the learning situation as being "near" or "far" from the point of use of the material to be learned may very well influence his learning of the material. Consequently, it should be highly desirable for the instructor to devote a portion of his time to pointing out the usefulness of the material and when it would probably be applied by the average student or trainee. It should be remembered, however, that the use referred to here is that *perceived by the learner,* not by the instructor. It would be desirable, therefore, for the instructor to employ some measure of the correctness of his assumptions regarding the usefulness of the material taught. In this connection, it would be possible, by means of an analysis of the responses to each item, to use the scale of perceived usefulness to determine how the students really did perceive the usefulness of the subject matter, and to adjust the presentation or course if necessary to make it appear more relevant to the students.[10]

[10] To score and test the scalability of a Guttman scale to be used for research purposes requires a fair amount of experience. However, it is suggested that teachers who may wish to obtain an indication of the perceived usefulness of instructional materials used in a course and who have not had experience in attitude scaling, could obtain much useful information without the necessity of scaling the responses. They should simply (a) have their students fill out copies of the questionnaire included in the Appendix, and (b) tabulate and examine the frequency of responses to each choice for each item.

APPENDIX

The Guttman Attitude Scale
Attitude Towards the Usefulness of a Film

_____I. As far as using the information in this film is concerned,
- a) I think I'll be able to use it very soon.
- b) I think I'll probably be using it in the near future.
- c) I think I'll find a use for it sometime.
- d) Right now I don't see any use for it.
- e) I don't think I'll be able to use it.
- f) I won't ever be able to use it.

_____II. If I have a chance in the future to find out more about the subject of this film,
- a) I surely will try to.
- b) I think I'd like to.
- c) I may be interested in doing so.
- d) I doubt if I would be interested.
- e) I wouldn't be very interested.
- f) I wouldn't have anything to do with it.

_____III. The information in this film is
- a) right in line with my main interests.
- b) has to do with something that interests me.
- c) is somewhat of interest to me.
- d) is neither interesting nor uninteresting, as far as I'm concerned.
- e) is not very interesting to me.
- f) is of no interest to me.

_____IV. To learn what was in this film
- a) seems absolutely necessary to me.
- b) seems rather valuable to me.
- c) would be a good thing to do.
- d) is fairly important, I guess.
- e) is of no particular importance to me.
- f) is more or less a waste of my time.

_____V. In my future work, the information in this film
- a) will be of great value to me.
- b) will probably help me a lot.
- c) should be of some value to me.
- d) will not be very helpful to me.
- e) will be of little use to me.
- f) will be of no use to me.

_____VI. Now that I've seen this film
- a) I certainly am glad I saw it.
- b) I think it was probably a good film for me to see.
- c) I guess it was worth seeing.
- d) I have no opinion about it, one way or the other.
- e) I think it was dull and boring.
- f) I think it was a waste of my time.

_____VII. If I were given the opportunity to see this film again,
- a) I would jump at the chance.
- b) I would like to see it again.
- c) I guess I would want to see it again.
- d) I would not care one way or the other.
- e) I would hesitate to see it again.
- f) I would not want to see it again.

_____VIII. I think this film covered a subject that
- a) I definitely ought to know about.
- b) will probably benefit me.
- c) might do me some good sometime.
- d) is of no interest to me.
- e) will probably not benefit me.
- f) I definitely do not need to know about.

_____IX. The material in this film is
- a) interesting, and I'll probably use what I've learned.
- b) interesting, but I don't think I'll use it very much.
- c) interesting, but I'll probably never use it.
- d) uninteresting, although it is important for my future work.
- e) uninteresting, but it could be useful.
- f) uninteresting, and I'll probably never have any use for what I've learned.

_____X. As far as educational films are concerned, this film is
- a) the most useful one I have ever seen.
- b) among the most useful I have ever seen.
- c) fairly useful.
- d) not very useful to me.
- e) quite useless.
- f) the most useless one I have ever seen.

TEACHING GENERAL SCIENCE THROUGH FILM PRODUCTION

• CARLTON W. H. ERICKSON

How effective is the use of student film production for the teaching of content in a subject matter area? This study shows the superiority of conventional film presentation techniques over such joint pupil-teacher film production. Carlton W. H. Erickson is director of the audio-visual center and associate professor of education at the University of Connecticut. The article is based on a doctoral dissertation at the Boston University School of Education, entitled, "The Effectiveness of Joint Pupil-Teacher Motion Picture Production as a Method of Teaching General Science."

THE EXPERIMENT reported in this article was conducted to determine the effectiveness of joint pupil-teacher film making as a method of teaching Grade IX general science. The effectiveness of the film-making activity was judged in terms of results achieved by another teaching method, of recognized merit, which made use of currently available instructional motion pictures. Data collected during the experiment enabled the writer to answer the following four questions:

1. Which of the two methods, film presentation or film production, was the more effective in terms of the acquisition of knowledge and the ability to apply this knowledge in a variety of situations?

2. Which of the two methods, film presentation or film production, was the more effective from the standpoint of permanence in learning?

3. Which of the two methods, film presentation or film production, is likely to be the more expensive?

4. Which of the two methods, film presentation or film production, did students prefer?

Detailed teaching units and four objective tests were constructed by the writer especially for this experiment. The tests were designed to measure acquisition of general science information, and also the ability to recognize the application of such information to a variety of novel situations.

EXPERIMENTAL DESIGN

The experiment began on September 20, 1954. On that date in each of two junior high schools in West Hartford, Connecticut, a teacher who had been supplied with all necessary teaching materials started out teaching the same unit of work, namely, *Understanding and Controlling Water for Man's Needs.* One teacher, following a detailed teaching blueprint organized teaching-learning activities around the solutions to a set of problems using a classroom library of some 42 reference books and a set of eight motion pictures related to a number of the problems by especially prepared film guides. The other teacher, using identical sets of books and problems, but with no motion pictures, set out to lead his class in a joint pupil-teacher effort to study the subject matter, plan, write, and produce a sound film on a topic directly related to the unit subject matter. Each teacher devoted four regular class periods to preinstructional and postinstructional testing, and 26 periods to the other prescribed activities under their respective teaching methods.

After 30 class periods, the necessary film-production equipment was exchanged and each teacher started the next unit, *Understanding and Using Foods Wisely,* immediately, using a different teaching method. The teacher who with his class had produced a film, now used currently available films, a set of which was supplied for his use for the entire six-week period, together with film guides, study guides, and the necessary reference materials. The teacher who had used available films during the preceding unit switched to the film-production method. Both teachers completed their teaching and testing in connection with the second unit after 30 regular class periods of instructional time on the same date December 20, 1954. Both teachers also administered retention tests on the same days, January 31, and February 1. The same tests previously given as pretests and final tests were used for this

purpose, but they were combined to permit their administration in two instead of four testing periods. Pupils were unaware that retention tests were going to be given and the subject matter taught during the retention period was prescribed by the investigator.

Prior to the experiment the teachers studied the *Teacher's Manual* which explained the required procedures fully. Also, prior to and throughout the experiment the writer personally instructed, guided, and checked the teachers in their daily teaching activities. Since neither teacher had tried the prescribed film-production method, the close supervision by personal conference and telephone was welcomed. According to plan, until the day the retention tests were given, the pupils in the two classes were unaware that an experiment was being conducted by the writer. This condition helped to prevent an artificial situation from developing as did the wholehearted cooperation of the teachers. Furthermore, the mimeographed material distributed to students contained no reference to authorship.

Every precaution was taken throughout the experiment to prevent the advantage from swinging to one group or the other. The rotation design employed for the experiment facilitated this effort since the effects of many uncontrolled variables were accordingly minimized or even cancelled out. The writer tried, however, to organize class groups that were fairly comparable as a precaution against introducing a variable that would affect the results of one method more than the other. All pupils in the two participating classes who had elected general science as a subject, were ninth-graders, and were assigned to the respective classes on the basis of IQ and sex. Some pupils were assigned to their participating group by necessity as scheduling difficulties arose, hence at the start of the experiment one class enrolled 28 and the other had 27 students. Several variables such as home background, mental ability, audio-visual education facilities, pupil grouping procedures, diversity of cultures, and favorable administrative attitudes toward research, were subjected to control in the selection of particular schools as the locale for the experiment. Other variables were brought under control by selecting two teachers who were equal or nearly equal in (a) over-all teaching proficiency at the better-than-average level, (b) teaching load, (c) willingness to participate and follow prescribed procedures, (d) knowledge of the photographic process, and (e) equal or nearly equal in their ability to make effective use of instructional motion pictures.

Both teachers were strictly restricted in their decisions regarding teaching plans to the activities and procedures prescribed in the *Teacher's Manual.* Thus the experiment imposed an artificial situation upon the teacher about which the students were unaware. But because details of the plan were so completely worked out in advance, teachers did not object to the restriction. Both teachers had just 30 class periods in which to complete the planned activities, they had to match extra-class pupil-hours of work under the writer's coordination, and they had to maintain a daily log of activities. They were required to conduct only those activities specified in the guide sheets, study identical problems, use identical sets of reference books, and act as co-workers with students in meeting and solving problems of film production. Teachers were also required to teach the same subject matter preceding the experiment from the opening-day of school, to teach prescribed subject matter following the experiment during the period immediately after the final tests until the retention tests were given, meet established film-production standards, refrain from assigning homework except to match extra-class pupil hours, and only then with the approval of the investigator, and refrain from teaching responses to test items.

Teaching methods employed for control and experimental groups were laid out in such detail as to be of maximum value for busy teachers. All necessary materials such as books, camera equipment, mimeographed general and special guide sheets, motion pictures, a complete bulletin board display including a layout diagram, film stock, and other supplies were delivered directly to the classrooms involved. The investigator also aided the teachers to stay within the established time limits by personally expediting all film footage processing. At the appropriate time, upon the contrived invitation sent by the teacher, the writer also supplied magnetic sound-recording equipment which facilitated the mixing of music and voice.

The measuring instruments needed for the experiment were designed, constructed, criticized, revised, tried out, analyzed, and put in final form. And since the four tests were to be given as pretests, again as postinstructional, criterion tests, and administered a third time as retention tests, a special experiment was conducted to obtain an estimate of the practice effect. The estimates so obtained, while helpful in interpreting experimental data, were not used in the statistical comparisons since the practice effect

presumably affected both groups and the results of both teaching methods the same under the rotation design. All items in the tests were based upon subject matter found in available general science textbooks, and not upon content of the films selected for use with control groups. In fact the tests were constructed before the particular films to be used had been decided upon.

The investigator's questions relative to the effectiveness of the film-production and film-presenattion methods so far as both achievement and retention are concerned were answered as a result of statistical analysis. This analysis was accomplished by the following techniques:

1. Compute the means and standard deviations of either the achievement or retention scores at the end of each unit of work, or at the end of the retention period.

2. Combine the means of achievement or retention scores for groups taught by the same method to discover the differences if any.

3. Calculate the significance ratios for the differences between *methods means* and test their significance.

The writer's question relative to comparative operational costs of the film-production and film-presentation teaching methods was answered by drawing conclusions from knowledge of the actual costs of the present experiment, or from estimates of what costs would be for similar operations if all services and supplies had to be paid for by the producer. The remaining question regarding the teaching method which students preferred was answered after an analysis of the replies to unsigned student reaction questionnaires.

RESULTS

Results of the experiment are best shown here in the answers to specific questions raised earlier by the investigator.

Which of the two methods, film presentation or film production, was the most effective in terms of the acquisition of knowledge and the ability to apply this knowledge in a variety of situations? The observed difference in achievement between control groups and experimental groups as regards the acquisition of facts and principles, and the difference in achievement in the ability to recognize the application of facts and principles were in favor of the control groups taught by the film-presentation method. This data is summarized in Table 1. The superiority of the control groups in acquisition of information amounted to 2.24 points of

TABLE 1—DATA FOR AND RESULTS OF THE TESTS OF SIGNIFICANCE FOR ACHIEVEMENT AND RETENTION EFFECTS OF THE FILM-PRESENTATION AND FILM-PRODUCTION METHODS

Learning Outcome	Control Group Film Presentation	Exper. Group Film Production	Difference in Means	t ratio	Degrees of Freedom	Level of Significance
Weighted Mean of Acquisition in Achievement Score Points	7.59	5.35	2.24	2.55	107	2%
Weighted Mean of Application in Achievement Score Points	1.90	1.24	.66	2.06	105	5%
Weighted Mean of Acquisition in Retention Score Points	.3	—.6	.9	1.20	100	Not Significant
Weighted Mean of Application in Retention Score Points	—.46	—.27	.19	.55	92	Not Significant

mean gain. The significance ratio in this case was 2.55, revealing that such differences would occur by chance alone but twice in 100 times. The superiority of the control groups in the ability to apply facts and principles showed itself in a difference of .66 points of mean gain, with a significance ratio of 2.06, revealing that such differences would occur by chance alone five times out of 100. In the light of this evidence the writer concludes that the film presentation was the more effective of the two methods employed in this experiment for both of the learning outcomes measured. Table 1 also contains similar data for the conclusions drawn regarding the effect of both teaching methods upon retention, and since the means of achievement scores in this table are shown without their relationships to raw scores on the tests, some facts regarding the differences between the groups as to status before and after instruction may be of value in studying further the reactions of the groups. Therefore the means of raw scores on unit pretests and final tests with reference to maximum possible raw score are supplied in Table 2.

Which of the two methods, film presentation or film production, was the more effective from the standpoint of permanence in learning? Neither method showed itself to be superior to the other. While small differences were found, they were too small to be statistically significant. One of the differences seemed to favor the control groups, and the other favored slightly the experimental groups. The data upon which these conclusions were based may be referred to in Table 1.

Which of the two methods, film presentation or film production, is likely to be more expensive? On the basis of actual and estimated costs of the experiment, the writer concluded that the film-production method is more expensive than the film-presentation method. In the present example, two films (black and white with magnetic sound track) were produced, and the total cost of these productions in a regular school situation might have amounted to $193.72, but certainly not less than $108.80 depending on the kind of finished print desired. Using the film-presentation method (on a rental basis) the cost would be at least $31, but not more than $61. It can be observed therefore that if one class of 27 students were to produce two films, such as were produced in this experiment, operating costs would exceed those attached to the film-presentation method for comparable subject matter by at least $2.88, but not by

TABLE 2—MEANS OF RAW SCORES ON UNIT PRETESTS AND FINAL TESTS TO SHOW ACHIEVEMENT STATUS OF PARTICIPATING GROUPS BEFORE AND AFTER INSTRUCTION

Unit Tests	Means of Pretest Scores		Means of Final Test Scores		Maximum Raw Score
	Plant Class	Talcott Class	Plant Class	Talcott Class	
Water: Acquisition	20.1 (c1)	18.3 (e1)	27.5 (c1)	24.4 (e1)	45
Water: Application	6.4 (c1)	6.1 (e1)	8.5 (c1)	8.0 (e1)	14
Foods: Acquisition	21.4 (e2)	17.5 (c2)	26.0 (e2)	25.3 (c2)	48
Foods: Application	8.6 (e2)	7.9 (c2)	9.1 (e2)	9.6 (c2)	14

Small letters and numerals in parentheses have the following meanings: (c1) indicates control group 1 taught the *Water* unit at the Plant School by Ransome Garrett using the film-presentation method; (e1) means experimental group 1 taught the *Water* unit at the Talcott School by Howard Hitchcock using the film-production method; (c2) indicates control group 2, *Foods* unit, Talcott School, film-presentation method, with Mr. Hitchcock; and (e2) refers to experimental group 2, *Foods* unit, Plant School, film-production method, with Mr. Garrett.

more than $4.91 per pupil. Dividing by two would give the expected difference in per pupil costs for using film-production method for only one unit of work.

Which of the two methods, film presentation, or film production, did students prefer? At the start of the next general science class period after the last test had been administered, students in the two participating groups were asked by their teachers to fill out the student reaction questionnaire which had been prepared by the writer. Candid opinions were asked for, and to facilitate the flow of expression, only the name of the school and date were called for, the students having been informed that signatures were unnecessary. Information given in the first three items of the questionnaire is summarized in Table 3.

TABLE 3—SUMMARY OF SHORT-ANSWER RESPONSE IN THE STUDENT REACTION QUESTIONNAIRES

(N at PLANT, 24; N at TALCOTT, 26)

Item	Plant School Responses	Talcott School Responses*	Combined Responses	Percent of Choices
1. Learned the most science?*				
Making a Film	8	13	21	43
Studying Films	16	12	28	57
2. Was film making important?				
Yes	18	25	43	86
No	6	1	7	14
3. Most enjoyable method?				
Making a Film	19	23	42	84
Studying Films	5	3	8	16

* One pupil omitted a response to Item 1.

It appears that there is agreement on the part of the students that the film-making activity seemed important to them, and there can be little doubt that these ninth-grade science students thought that of the two learning methods making a film was the more enjoyable. However, pupils in the Talcott school group were evenly divided over the question of how much science they learned under the two methods. On this point the Plant school seemed to differ substantially from their fellow students at Talcott. At Plant

two-thirds of the students felt that they hadn't learned as much science as under the film-presentation method. Yet, more than two-thirds of these students thought that film making was important and that they enjoyed it more than the film-presentation method.

Of the fact that students enjoyed the film-making method more there can be little doubt. Their candid, written responses as to why one method or the other was most enjoyable should be of interest to teachers everywhere. Since space does not permit all the responses being given here only a few of the different reasons given by the students of both groups follow:

Film Production Enjoyed More (Forty-two pupils)

The activity was: new, fun, exciting, enjoyable, a new experience, interesting, different. It was a wonderful experience. It made me more interested in the subject.

We didn't learn only what we were studying, but we learned about photography and script writing.

We did what we did all together, and worked like a team. Everyone had a part.

We were able to contribute something to the film, even a report.

Our film was something to be proud of.

Whatever job you did in film making you could consider it as an occupation.

In making a film we had chances to go places and it made you feel big.

Film Presentation Enjoyed More (Eight pupils)

The people who made the film didn't have a chance to do as much studying as the others did.

Because the making of the film took too long, and to tell you the honest to gosh truth I didn't learn much from the film.

I liked the study guide and that's where I found most of the things I should know about food.

The writer concluded that while the preference was not unanimous, these ninth-grade general science students liked the film-production method, but did not always feel they learned the most science by that method.

TEACHER'S REACTIONS TO THE EXPERIMENT

Using a teacher-reaction questionnaire, the writer found out that while both teachers felt that the film-production method was the most difficult to use, it nevertheless gave the greatest professional satisfaction. Also, both teachers believed that the film-production method was a good one for general science, and for other subjects, too. They stated their willingness to perform the experiment again "next year." Both teachers also expressed the opinion that the unit method as employed was a good general

method for teaching general science, that participation in the experiment was profitable professionally for them, and that they expected to engage in other joint pupil-teacher production projects as a further learning activity. Apparently negative bias did not develop during the experiment on the part of either teacher.

CONCLUSION

Differences in achievement under the two methods in the acquisition of information and in the ability to apply information to novel situations were in favor of the film-presentation method, and were large enough to be significant at the 2 and 5 percent levels of confidence respectively. Therefore, under the conditions of this experiment, joint pupil-teacher film production was not as effective in producing achievement in the learning outcomes measured as the film-presentation method. As regards retention of learning, the experimenter concluded that neither method was superior. It was also found that the film-production method was more costly, and that most pupils preferred it even though they did not always feel that they learned the most science by that method.

TECHNOLOGICAL LEGACY OF AUDIO-VISUAL COMMUNICATION

• L. PAUL SAETTLER

This is the last in a series of four articles tracing the historical development of AV communication. Earlier papers presented a historical overview, the history of AV education in city school systems, and the conceptual legacy of AV communication. L. Paul Saettler is assistant professor of education at Sacramento State College, California.

THE TECHNOLOGICAL revolution has progressively and unprecedentedly extended communication frontiers from the time of Gutenberg's printing press to the automation era. Simultaneously, these technical advances have exerted a direct and fructiferous impact upon the rise and growth of the audio-visual communication movement. In order to highlight these twin revolutions of technology and communication, this paper will present a historical overview of the devices and processes which have significantly contributed to the transmission of pictorial and auditory forms of communication.

PROJECTED STILL PICTURES

The forerunner of the modern stereoscope, filmstrip projector, opaque projector, micro-projector, slide projector, and overhead projector was the Magia Cataprica or magic lantern of Anthanasius Kircher. In 1646 Kircher described the first recorded demonstrations of a magic lantern. His lantern complete with source of light, reflector, and lens was used to project images of devils and demons on the wall. He changed his pictures rapidly by painting them on a revolving glass cylinder. A few years later, de Chales improved the instrument; and in the eighteenth century a Dutchman named Musschenbroek made it possible to simulate motion by using two superimposed slides. Aside from its effective use in the classroom, the lantern . . . "offered a consecrated alternative to the carnal attractions of the theater and the circus."

The stereoscope. More than 2000 years ago, Euclid discovered the principle of stereoscopic vision. When C. Wheatstone first observed a stereoscopic effect in 1833, he was stimulated to construct a mirror stereoscope. Ultimately, other mirror stereoscopes were made by H. W. Dove, Sir David Brewster, and others; but it remained for Oliver Wendell Holmes to refine the stereoscope and to bring about its popularization in the United States.

Filmstrips. In 1920 John R. Bray of the Bray Pictures Corporation invented the first filmstrip projector, and called it the "Brayco." Simultaneously, Bray developed the first filmstrip. In 1931 the first synchronized sound recordings were made to accompany the filmstrip.

Micro-films. When Paris was besieged in 1870 during the Franco-Prussian War, a photographer named Dragon under the stress of the moment invented a process of photographing messages on collodion or wet-plate emulsion. The process was generally forgotten until it was again introduced at the Paris Exposition in 1937. Pioneers in the development of microphotographic laboratories were the University of Chicago and the United States Department of Agriculture.

The tachistoscope. The first development of the tachistoscope occurred in the German psychological laboratories of Wundt and others during the latter half of the nineteenth century. By 1938 the modern tachistoscope had been developed and the first controlled experiments had been conducted in the schools of Erie, Pennsylvania.

PICTORIAL AND GRAPHIC ARTS

One of the most vital threads in the technological warp of audio-visual communication has been the camera and its by-products.

The camera. Even though camera pictures have existed since the Renaissance, the principles of the camera obscura were well known to such men as Aristotle, Euclid, Leonardo da Vinci, Kepler, and Robert Boyle. The first cameras, as large as a modern room, reflected nature, but it remained for the invention of photography to capture its illusive images.

Photography. The discovery of photography cannot be attributed to any one man. Rather, it has resulted from the observations

and experiments of early alchemists and chemists on the action of light. The gradual blackening of silver and its compounds was known to the ancient Egyptians. However, it was not until 1727 when Heinrich Schulze, of Germany, using a mixture of silver nitrate and chalk under stenciled letters, proved definitely that the darkening action was due to light and not to heat. After a rather long experimental period, the first successful photographic processes were made public by Daguerre, Talbot, and Herschel in 1839. The first substantial technical improvement came in the 50's when calcotypy and daguerreotypy were replaced by the wet-plate or collodion process. Important changes next came in the 80's when the entire photographic process was simplified by the introduction of dry plates and celluloid film. Since this time films have been improved in speed and color sensitivity and various ingenious accessories have been added, but in all essentials the process used today had been perfected by 1889.

Lithography and woodcuts. There is no dispute among scholars concerning the invention of lithography, since Alois Senefelder related the facts of his invention in *A Complete Course of Lithography* (1818).

The first successful and continuous venture in the field of the pictorial press occurred when Herberg Ingram published the first issue of the *Illustrated London News* on May 14, 1842. In the United States Frank Leslie published the first number of *Frank Leslie's Illustrated Newspaper* on December 15, 1855. Two years later *Harper's Weekly* began to use illustrations.

The greatest influence exerted upon the illustrative art by photography was through the woodcut. Closely allied to photography on wood was photography on zinc. This process, originated by Gillot of Paris in 1859, was especially suitable for printing maps, plans, and diagrams. The development of these relatively simple photo-mechanical processes ultimately led to the use of illustrations in daily newspapers. Up until 1870 there was no successful method of reproducing continuously the intermediate tones between pure black and white by a mechanical process. However, in that year the Woodburytype and the Alberttype was invented. A few years later, the far more flexible "half-tone" process was developed.

Photoengraving. Photoengraving was perfected about 1860 by one Mungo Ponton. Although this process of line engraving by

photography speedily displaced wood engraving, it was not immediately applicable for views containing large areas of continuous shade and grays, rather than blacks. Some means of breaking up half tones and shades into narrow blacks and whites was supplied when Frederic Ives of Philadelphia perfected a screen whereby the half tones and extended whites of the negative were broken up by inserting a multitude of black dots. Meanwhile, James Clerk Maxwell showed that any desired color may be reproduced by a proper mixture of three well-chosen primary colors.

Photolithography. In 1859 J. W. Osborne of Melbourne, Australia, patented his process of photolithography. This process is not directly applicable to shaded pictures. It is based, like almost all photoengraving processes, on the peculiar action of light on bichromatized colloids.

Photogravure. The process of intaglio engraving was first developed by Karl Klietsch of Vienna, who adapted it to cylinder printing. Today it is used in the rotogravure section of a modern newspaper.

Other processes. A very ingenious and curious method of engraving was perfected by Walter Woodbury about 1864. He printed his negative on bichromated gelatin and washed away the parts unhardened by light.

A gelatin collotype process, which gives the most exact reproduction of the finest detail of any method of engraving, was developed by Poetevin in 1855.

The most useful expedient for laying on tints in drawings and engravings was devised by Benjamin Day in 1879. It consists of a flexible, transparent film, as of celluloid or other similar substance, on the lower side of which is contained a reticulated surface of some design.

Posters. The first posters were drawings made on cave walls and scratches on the ribs of palm leaves or elephant tusks. Tablets of wood, papyrus, and parchment were used in ancient Greece and Rome for the purpose of issuing announcements. In later days, with the rise of trades and guilds, the signboard was adopted as a form of advertisement. After the invention of printing, the first letterpress posters made their appearance. Although the term "poster" came into existence in the sixteenth century, the first modern poster was invented by Jules Cheret in 1867.

Cartoons and caricatures. The history of cartooning and caricatures began in prehistoric times. In ancient remains, drawings have been found lampooning the foibles of man, especially of the great and pretentious. Since both the cartoon and the caricature depend chiefly for their existence on circulation, the effect of printing upon their development has been tremendous.

Comics. The remote ancestry of the comic strip would include the Hogarthian figures of "The Rake's Progress" and "Marriage a la Mode" as well as the work of Rowlandson, Cruikshank, Daumier, and Philipon. The indigenous product first found expression on the back pages of American magazines of the latter half of the nineteenth century. The first comic book was published in 1911.

Charts and graphs. The historical development of charts and graphs has stemmed primarily from the graphic representation of statistical data. The first example of this graphic method, which Playfair called "lineal arithmetic" can be found in his *Commercial and Political Atlas* of 1786. In the *Atlas,* the first known use of the bar graph appears, and in Playfair's *Statistical Breviary* the first circle and pie graphs are illustrated.

One of the most important influences on the development of the graphic method was exerted by the nine International Statistical Congresses held periodically during the years 1853 to 1876. Within the period covered by the congresses, statisticians and educators alike became aware of the value and importance of graphs in instruction. Even though there is little evidence that any appreciable use of graphs was made in textbooks before the beginning of the twentieth century, Lavasseur began to introduce diagrams into his textbooks on geography in 1865.

The most recent development in the graphic method has been Neurath's pictorial statistics. Although Michael George Mulhall and Jacques Bertillon were the originators of picture statistics or pictograms, the "Vienna method" of Otto Neurath has made a contribution to graphic representation by a development of a standardized symbolism for the pictures and hieroglyphics suggested and used by earlier writers.

Maps and globes. Maps have been made since ancient times. The Egyptians were famed as "geometers," and as early as the days of Rameses I, a cadastral survey was made of the country showing on a map the rows of pillars which separated the names as well as

the boundaries of the landed estates. During the Renaissance Leonardo da Vinci devised the "Mappemonde" from a Portuguese globe and, by dividing the globe into eight sections, anticipated the "Butterfly" or "Global Gore" map.

Mercator's invention of his "cylinder projection" inaugurated the beginning of modern maps. The successors of Mercator later devised such variations as the conic, polyconic, sinusoidal, and azimuthal projections.

The chalkboard. The chalkboard, or more commonly the blackboard, is a modification of the Roman waxen tablet and the hornbooks of the Middle Ages. The first edition of the *Orbus Pictus* (1658) by Comenius illustrated a schoolroom with a blackboard, but it is not known precisely when blackboards were first used.

THREE-DIMENSIONAL MATERIALS

Modern technology has developed many new three-dimensional audio-visual materials. These include such items as sand-table reliefs, carvings, miniatures, dioramas, mock-ups, and models. While it is true that some of these materials antedate the full flowering of the industrial revolution, the inventive genius of modern man has made it possible to reshape and refine many of these displays.

The making of and use of models is as old as mankind. In ancient times the Egyptians believed that their human spirit, after death, was incapable of crossing bodies of water. Therefore, they buried a model boat with their dead so that the soul might be assisted across the river. An early model dealing with steam was built by Hero of Alexandria about 120 AD. Early in the eighteenth century, William Murdock joined Watt in making what was probably the first model locomotive. Today many schools and educational agencies are building a wide variety of ingenious three-dimensional models, mock-ups, and dioramas.

MOTION PICTURES

The history of the motion picture coincides with the birth of human expression. It began from the time when man endeavored to transmit emotional stimuli and recreate experience by tracing crude pictographs and carving strange sculptural figures on the walls of his cave. Even though the stylus and chisel could not attain his ideal of motion, he attempted to visualize it by molding a caval-

cade frieze on the walls of the Parthenon. Not until technology developed optics and chemistry did man achieve his early concept of the motion picture.

Early historical background. From the days of Aristotle, one can find fragments of ideas which were groping toward the motion picture. Some 65 years before the birth of Christ, the Roman poet Lucretius noted the fact of persistence of vision in his *Rerum Natura.* About 200 years later, the Greek astronomer Ptolemy experimentally proved its existence when he revolved a spot of color to form an apparently continuous circle. In 1824 Peter Mark Roget, the author of the famous *Thesaurus of English Words and Phrases,* presented before the Royal Society of Britain a paper which concerned the first scientific investigation into the phenomenon of illusory motion.

Meanwhile, largely due to the inspiration of Roget, such men as Sir John Herschel and Michael Faraday experimented with motion; while Joseph Plateau, Simon von Stampfer, William Horner and Franz Uchatius invented twirling disc devices simulating motion. In Horner's zoetrope of "wheel of life" toy, slots were arranged around the top on a rotating hollow cylinder with drawings of paintings arranged around the inside of the cylinder on the bottom. Another variation of the zoetrope was the praxinoscope in which a mirror, made up of several facets, was used in the center of a rotating solid cylinder. However, all these methods except the praxinoscope caused a distortion of the images.

By 1860, photography had progressed to the extent that short exposures could be taken, but not fast enough to record objects in motion. The following year, Coleman Sellers of Philadelphia invented the kinematoscope—a machine consisting of various pictures arranged around an axis, much like the paddles of a water wheel. A patent application submitted by Louis Ducros Hauron in 1864 completely anticipated the motion picture but the Heyl zoetropic device, developed in 1870, was the culmination of the contributions of earlier pioneers. In this year, the motion picture had been attained and was complete in every detail except that it was still necessary for the camera to acquire the ability of making the basic record negatives at the speed of reality.

The next vital evolutionary step in the development of the motion picture occurred in California. It is widely known that

Governor Leland Stanford made a $25,000 wager to the effect that in a gallop, all four feet of a horse are off the ground at once; that he hired one Edward Muybridge, a world famous photographer, to prove it with pictures. It is less commonly known, however, that Muybridge failed in his efforts until John D. Issacs of the Central Pacific Railway worked out a photographic system which eventually enabled Muybridge to enjoy all the fame and prestige growing out of the achievement of capturing the movements of a galloping horse.

Perfection of the motion picture. On October 6, 1889, the first model of the Edison Kinetoscope and the parent of the modern motion picture art was demonstrated at the Edison Laboratories in West Orange, New Jersey. Edison's first motion picture machine recorded spirals of tiny pictures on a cylinder, in the pattern of a phonograph groove. Because of the problems of magnification, he conceived of the idea of images being handled on a tape or belt. His first experimental films were unsatisfactory because of the fragile film material, but Edison soon discovered Eastman's flexible photographic film and his problems were solved.

Development of motion picture projectors. By the winter of 1894, a demand arose for a machine which could combine the kinetoscope's film record with the magic lantern so that the picture might be freed from the peep show. Edison had experimented in projection, but he hampered the development of the idea of mass projection because he felt that large audiences would exhaust the novelty of his pictures too rapidly.

During the decade, 1895 to 1905, a wide variety of motion picture projectors was developed. Among these, the Vitascope proved to be the most important because its inventors, Thomas Armat and C. Francis Jenkins, discovered the modern projection principle of intermittent motion and first applied it to this projector. Most early projectors were theatrical machines adapted for booth projection in auditoriums, but these were later supplemented by less expensive, less cumbersome portable and semiportable 35 mm projectors to meet the demands of classroom projection. One of the more popular projectors was the Edison Home Kinetoscope which met the school requirements of simplicity, economy, and portability to a considerable extent. Other machines commonly used in the schools were the Acme, DeVry, and Victor "suitcase projectors." A nontheatrical projector called the Graphoscope stood

midway between the professional and the suitcase machines. The first sound projector was designed by R. P. May of RCA in 1930.

Technical improvements. Shortly after the development of the motion picture, there arose a demand for international standardization of motion picture films and equipment. As motion picture technology progressed, an almost endless series of technical innovations and improvements were made. Consequently, continuous technical refinement eventually transformed the motion picture from a crude, flickering mechanism to one of spectacular precision. The Marey Institute in Paris developed the first slow-motion, ultrarapid, X-ray, time lapse, and microphotographic techniques. Other major advances in motion picture technology have been the development of 16 mm reversal film, animated cartoons, sound and color films, wide and "Cinerama" triptych-type screens, 3-D, and stereophonic sound.

AUDITORY MEDIA

Many scientific and technical discoveries made in the fields of electricity and magnetism have set the landmarks in the development of such auditory media as the record and transcription player, the wire and tape recorder, the public address system, central sound system, and most significantly, the invention of radio.

Radio. With the discovery of radio waves by Heinrich Hertz in 1886, an intensive period of experimentation began in both Europe and the United States. In 1895 Guglielmo Marconi transmitted a signal over a distance of 1000 feet across the Bolognese estate of his father, and subsequently was officially credited with the invention of radio. At first, the Marconi "wireless" was confined to telegraphic code. Radio broadcasting as it is known today was later made possible by the technological contributions of Vladimir Poulsen, Lee D. Forest, Sir John Fleming, I. Langmuir, and Reginald Fessenden.

Another important milestone in radio broadcasting occurred in 1938 when FM radio was perfected by E. H. Armstrong. Educators throughout the country were quick to see the opportunities offered by this new technical development. As the result of hearings held by the Federal Communications Commission during the years 1938, 1939, and 1940, 20 FM channels in the 88 to 92 megacycle range were allocated to education.

The phonograph and disc recordings. The idea of a phonograph was an early dream of the human mind. Even though various German experimenters had recorded sound on tin foil, the first practical phonograph was invented by Thomas Edison in 1876. All the first models were hand-driven and made use of ear tubes.[1] Later came the spring-motor and horn models. In 1925, the Orthophonic Victrola and the Electrola were placed on the market and eventually revolutionized both recording and playing techniques. Perhaps the most significant modern innovation was the introduction of the LP or microgroove record in 1948.

Magnetic recording. In the last few years great strides have been made in magnetic recording. However, actual experimentation with magnetic wire recordings was begun by Valdimir Poulsen, a Danish physicist, in 1895. Several years later, the efforts of Poulsen resulted in a magnetic wire recorder which was known as the Telegraphone. Because this wire recorder was never commercially successful, magnetic recordings remained in the laboratory until Marvin Camras, under the sponsorship of the Armour Research Foundation of the Illinois Institute of Technology, developed a commercially feasible product in 1942. Beginning with the commercial production of wire recorders, the Armour Foundation turned its attention to tape. One department at Armour worked out the solutions to the mechanical and electrical problems while another studied the relationship of the chemistry and magnetics of iron oxide. Thus, the magnetic tape recorder progressed simultaneously with the development of recording tape. Undoubtedly, the recent development of the video tape recorder will inevitably exert an effect upon television comparable to the one made by the audio magnetic tape upon radio and recordings in the past.

FACSIMILE

Alexander Bain first used a wire circuit to mark paper in 1842. He can be called the father of facsimile because his electrochemical recording telegraph established the primary elements of modern facsimile apparatus.

Since the development of facsimile broadcasting, many technical developments have been made. The color fax system, which sends colored pictures by radio facsimile, was first demonstrated

[1] The phonograph was probably first used for teaching purposes in the Milwaukee Public Schools in 1909.

experimentally in 1947. The following year, ultrafax, which can deliver printed messages with the speed of light, was demonstrated by the Library of Congress. Multiplexing has made it possible for FM aural programs and facsimile to be transmitted simultaneously over the same assigned wave length.

TELEVISION

Like many inventions, television is the product of the insights and discoveries of many men through the ages. Even though there is some doubt about where television began and who first coined the word, there is no lack of evidence that television owes much to the important technical contributions made in electricity and radio.

The first significant event in television occurred in 1873 when it was observed that crystalline selenium was photo-electric. Two years later, C. R. Carey of Boston designed the first television system. In 1875 John Kerr discovered the "Kerr Effect." Simultaneously, television systems were being designed by Sawyer, Senlecq, de Paiva, and Leblanc. Most scientists, however, begin their history with Paul Nipkow because it was he who patented the first television mechanical scanning disc.

It was obvious that the mechanical method of scanning had to be replaced if satisfactory television reception was to be achieved. It remained, therefore, for Vladimir Zworykin to revolutionize television by his development of an all-electronic television receiver which he called the Kinescope. In 1933, when Zworykin developed a completely electronic camera which he called the iconoscope, the electronic barrier was crossed and modern television had come of age.

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DOCTORAL DISSERTATIONS IN AUDIO-VISUAL EDUCATION

• JOHN MOLDSTAD

This listing of doctoral dissertations in the field of AV education will serve as the basic compilation of such studies and will be supplemented annually in future issues of the journal. The assembly of such a comprehensive bibliography is a difficult task and errors or omissions may have occurred. The author or editor will appreciate information relating to such inconsistencies so that corrections may be made in future listings. John Moldstad is assistant professor and assistant in research at the Audio-Visual Center, Indiana University.

IMMEDIATELY after World War II it became evident that the use and development of audio-visual materials in education, industry, and religion were on the upswing. The effective utilization of all types of audio-visual materials and equipment by the Armed Forces had convinced many present and future educators of the educational potential of these new materials.

Testimonials by teachers, and reports of foundation research began to appear in journals of almost every discipline attesting the effectiveness of these aids in various teaching and in-service training situations. However, anyone desiring to make a comprehensive study of this literature in a particular area soon discovered that he was confronted with a Herculian assembly task. The need for a comprehensive bibliography of the literature in this field was evident.

In the second semester of 1949-1950, L. C. Larson and Charity Runden of the Audio-Visual Center, Indiana University, decided to attempt the task. Working with 16 students enrolled in a graduate seminar, they selected 25 sources of bibliographies and indexes known to contain listings of articles and research reports related to audio-visual education. Using these sources, the group developed a listing of pertinent articles published between 1930 and 1950. *Doctoral Dissertations Accepted by American Colleges and Universities, Psychological Abstracts, Educator's Guide to Periodical*

Literature, and the *Review of Educational Research* were among the sources covered. As a result of this cooperative effort, the *Bibliography of Research in Audio-Visual Education and Mass Media, 1930-1950* and *Supplement I*[1] were compiled for use by researchers in this field.

After 1950 it became apparent that the continuation of such a bibliography would not be possible due to the increasingly large number of articles appearing in the journals and the personnel costs required to perpetuate such a project. The quality and quantity of doctoral dissertations being completed by audio-visual specialists getting advanced degrees at various institutions suggested that, if a limitation had to be made, a comprehensive bibliography of these studies would be of greatest value to the field. From 1952 to the present time various staff members of the Indiana University Audio-Visual Center have worked intermittently on compiling this 459-item bibliography.[2] *The Audio-Visual Bibliography*,[3] *Instructional Film Research, 1918-1950*[4] and *Research Studies in Education, 1954*[5] as well as any other sources that seemed to have possible listings of doctoral studies were investigated. Finally, a preliminary bibliography of all doctoral dissertations collected and an accompanying form requesting corrections and additions were sent to deans of all schools of education and/or heads of all departments of education in the United States. Deans of graduate schools, schools of journalism, and schools of communication were contacted whenever it was felt that doctoral theses in the area of audio-visual education might have been completed at these institutions.

Regardless of these precautions, the author realizes that there will be additions and corrections and would greatly appreciate notification concerning these so the bibliography may be as comprehensive and correct as possible.

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[2] In addition to Professor Larson, Dr. Runden, and the author, the following people have made significant contributions to this project: Ned Reglein, formerly associate professor and associate in Utilization and Research; Donald Auster, formerly research associate; and John Fritz, assistant in selection, Audio-Visual Center, Indiana University.

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SCOPE OF THE BIBLIOGRAPHY

One of the most difficult decisions concerning this project was the definition of the scope of the materials to be included. Types of doctoral dissertations finally agreed upon included: (a) studies dealing with the effects of audio-visual materials on learning, attitudes, and human behavior in general, with the term "audio-visual materials" used in a broad sense so as to include not only educational but also commercial films, filmstrips, radio, television, comics, graphs, charts, pictures, etc.; (b) doctoral dissertations concerned with evaluative or analytical studies of audio-visual administration, such as organizational structure, finance, selection, and distribution practices; and (c) other studies dealing with the structure and organization, content characteristics, audience, and effects of commercial and educational media of mass communication.

METHOD OF CLASSIFICATION

In order to facilitate use of the bibliography, an attempt was made to classify the studies under the following categories:

A. Administrative
   1. Administrative structure and practices — status and evaluation of audio-visual programs
   2. School plant facilities — provisions for audio-visual education

B. Audience
   1. Characteristics and habits — the characteristics and listening, reading, and viewing habits of various types of audiences
   2. Methodology—audience research methods

C. Media and Materials
   1. Content—studies of either the content of the media or of specific units of material or both
   2. Nature, Structure, History—analytical or survey approaches in these areas
   3. Use and Evaluation (nonexperimental)—programs of use in specific areas; analysis and evaluation of materials and their uses

D. Effect Studies
   1. Media—experimental studies dealing with the use of a specific medium or of media and analysis of the effects on a particular audience

2. Variables—experimental studies involving the following interrelationships:
   a. Stimulus constant and audiences or audience characteristics varied
   b. Stimulus varied and audiences or audience characteristics constant
   c. Both stimulus and audiences or audience characteristics varied
3. Utilization—experimental comparison of the effects of different methods of use of materials and/or media
4. Methodology — studies of methodology in appraising effects

E. Teacher Training
   1. Methods and Programs—audio-visual instruction as applied to teacher training
   2. Teacher characteristics — attitudes regarding media and/or audio-visual instruction, and studies of desired competencies.

The author is fully aware of the numerous errors which result from a classification of this type based only upon the title of the dissertation. Nevertheless, a classification based on the above-mentioned code has been entered before each bibliographical listing since it is hoped that the benefits in saving of time to audio-visual researchers will more than offset occasional misclassifications.

INTERPRETATION OF FINDINGS

The bibliography which follows contains 459 titles of doctoral dissertations in audio-visual education completed up to the present time. This progressive development is shown in Table 1.

TABLE 1—NUMBER OF DOCTORAL DISSERTATIONS COMPLETED BEFORE 1936 AND FROM 1936 TO THE PRESENT

Period of Development	Number of Studies Completed
Before 1936	39
1936-1940	56
1941-1945	55
1946-1950	81
1951 to the present	228

Perhaps the most significant evidence presented in Table 1 is the striking increase in audio-visual doctoral research between

1946 and the present time, with the number of studies completed since 1951 almost equalling all studies completed before that time.

An encouraging aspect of this study is that the 459 audio-visual dissertations were undertaken at 59 colleges and universities throughout the country rather than at just a few graduate schools, as one might believe. Figure 1 presents the total number of audio-visual dissertations completed at the 13 institutions contributing at least 10 studies. It also indicates the proportion of each institution's total number completed before and after 1950.

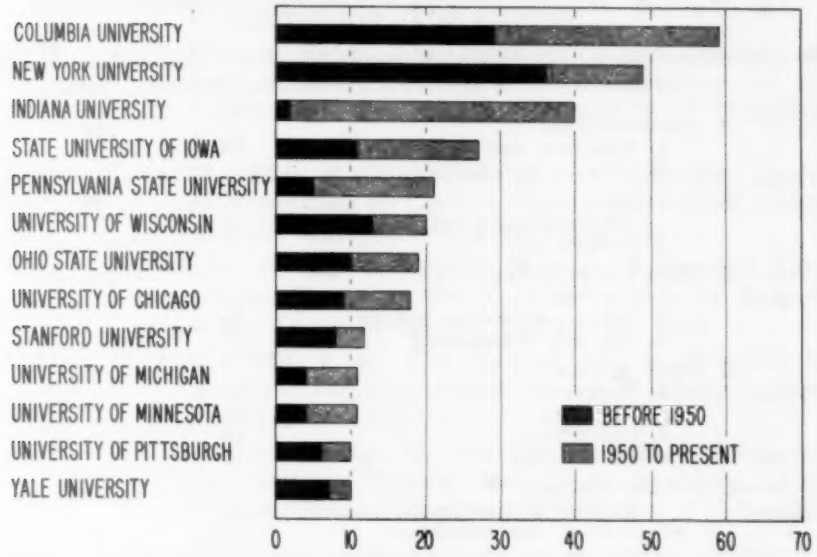

Figure 1

Number of Audio-Visual Doctoral Dissertations Completed by 13 Institutions Contributing 10 or More Studies.

The data in Figure 1 show Columbia University to be the leader in total number of dissertations completed followed by New York University and Indiana University. Further examination reveals that since 1950 graduate students at both Indiana University and Columbia University have completed about twice as many doctoral studies in this area as have students from any of the other institutions. Indiana University and Pennsylvania State University appear to have made the greatest percentage gains. One significant finding is that these 13 schools have been responsible for 307 of the 459 studies. It is gratifying to learn that these institutions are

making such a contribution. At the same time, one might justly wonder why many of our leading graduate schools are not assuming their share of the responsibility for pushing out the frontiers of knowledge in this important area of education.

What types of studies have been undertaken as doctoral theses in various areas of audio-visual education? Results of the classification of completed studies according to the system outlined earlier in this report are shown in Table 2.

TABLE 2—CLASSIFICATION OF DOCTORAL DISSERTATIONS IN AUDIO-VISUAL EDUCATION

Categories	Number of Studies	Total
A. Administrative		59
1. Structure and practice	58	
2. School plant facilities	1	
B. Audience		28
1. Characteristics and habits	25	
2. Methodology	3	
C. Media and materials		201
1. Content	19	
2. Nature, structure, history	29	
3. Use and evaluation	153	
D. Effect studies		150
1. Media	80	
2. Variables	49	
3. Utilization	19	
4. Methodology	2	
E. Teacher training		21
1. Methods and programs	14	
2. Teacher characteristics	7	

Within the classification limitations previously noted, it appears from Table 2 that approximately two-thirds of these studies were specifically concerned with audio-visual media and materials and with experimental evaluations of their effectiveness. Areas which seem to have been neglected by those doing doctoral dissertations include school plant facilities, audience study, content analysis, and the development of models and theories explaining the communication process. Further analysis of titles reveals far too few experimental studies designed to test the effectiveness of audio-visual materials in various academic areas and on particular levels within various disciplines. In most cases, only two or three systematic, controlled evaluations of the contribution of these materials in the teaching of mathematics, language arts, history, etc. have been

completed. Areas such as science and social studies have but a few more. The extent of doctoral research in these areas seems particularly inadequate when one is reminded that there have been literally thousands of studies reported in the area of reading alone.

It is hoped that this bibliography will enable future researchers to utilize better present findings in order to improve both the quality and quantity of future research in audio-visual education.

A BIBLIOGRAPHY OF DOCTORAL DISSERTATIONS COMPLETED IN THE AREA OF AUDIO-VISUAL EDUCATION

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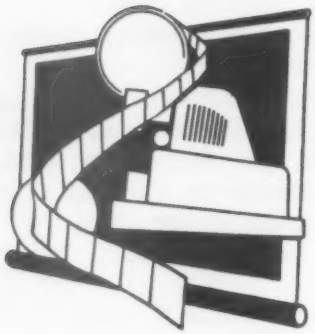
THIRTY NEW UNIVERSITY-PRODUCED FILMS



FILM

Reviewed by
• ROBERT W. WAGNER

Each year, the newest university-produced motion pictures are screened for, perhaps, the most critical audience they will ever have. This audience is composed of writers, directors, cameramen, editors, sound recordists, producers, and teachers from universities and colleges in the United States which have production and/or teaching programs in cinema. The occasion is the annual conference of the University Film Producers Association.

The producers of films shown at this festival, which lasts a full week, get no awards, no plaques, no certificates of merit. What they do get is solid criticism of their work, suggestions for improvement, and help from their colleagues in solving production problems. The stimulation of honest appraisal and the interchange of technical information have resulted in material improvement of the university-produced film.

Here, in capsule form, are some of the ideas on film which appeared at the 1956 meeting of the U.F.P.A., held at the University of Mississippi. All films listed are 16 mm sound.

Anger At Work (University of Oklahoma; 20 min.; b&w.)

Subtitled "The Headache Switch," this film shows how people tend to transfer their emotional upsets to others. One sequence, for example, shows the boss pouring his ire on an employee who, in turn, passes it on to his wife, who transfers it to the child, who kicks his dog, who winds up chasing a neighborhood cat. Intended for an adult audience, the film was produced in cooperation with the Oklahoma Division of Mental Hygiene and is distributed through the International Film Bureau.

Robert W. Wagner is associate professor and director of motion picture production at Ohio State University.

Beyond Teaching (University of Illinois; 30 min.; color.)

This film documents the contribution of research workers and scientists at the University of Illinois. Research in agriculture, engineering, physics, medicine, and other fields is shown as the job of a university "beyond teaching," and is strikingly portrayed.

Black Cat, The (University of Southern California; 14 min.; color.)

A student-produced film version of Edgar Allen Poe's short story. Using simplified sets, this presentation is suspenseful as the author's own intent.

Bunker Hill (University of Southern California; 18 min.; b&w.)

A graduate project of the Department of Cinema, this film shows the problems of a group of people in the "Bunker Hill" section of Los Angeles who are about to be moved from this old district to make way for a modernized building program. The story is told by the voices of some of the folks who live on the Hill—a doctor, a pharmacist, a carpenter. This is a very warm, human theme dug from a very big, cosmopolitan city.

Clay on Your Hands (Wayne State University; 20 min.; color.)

Intended for adult art classes, this film gives an over-all view of the field of ceramics, beginning with the types of clay used. In part a "how-to-do-it," the picture might be more accurately described as an incentive film—an invitation to ceramics.

Dartmouth Visited (Dartmouth College; 30 min.; color.)

Produced primarily for a secondary-school audience, this picture is intended to help the alumni interest high-school graduates of good academic standing in enrolling at Dartmouth.

Flannelgraph (University of Minnesota; 22 min.; color.)

Sara Lahti, a demonstration teacher in the Minneapolis Public Schools, explains the technique of making the flannelgraph, and is then shown using this visual aid in an elementary-school classroom.

Heart of a Community (University of Mississippi; 25 min.; b&w.)

The story of a hospital, what it means to a community, and how the public can support it. Intended for public relations purposes.

High Contrast Photography for Instruction (Indiana University; 14 min.; color.)

One of a series of films on the preparation of inexpensive instructional materials, this picture is designed to show teachers the fundamentals of making photographic copies and slides of line-drawings and other contrast materials.

Highest Ideals, The (University of Nebraska; 27 min.; color.)

A public relations film, produced for the National Society of Pershing Rifles, dealing with the history and aims of this military honor society of the Reserve Officers Training Corps.

Homemaking Education in Florida (General Extension Division, University of Florida; 30 min.; color.)

Sponsored by the Division of Vocational and Adult Education of the State Department of Education, this film attempts to interpret the homemaking education program for the public and the schools of Florida.

Introduction to Work Sampling (University Extension Division, University of California at Los Angeles; 19 min.; color.)

Designed for use by management, this film explains the random sampling technique and how to use it in job analysis. By means of a large panel containing 480 wood blocks representing the 480 minutes of a work day, the picture explains and demonstrates how a random sample can be used to predict the whole.

Learning Is Searching (Vassar College; 29 min.; b&w.)

A third-grade class in the New Lincoln School of New York City studies man's early tools through experience in classroom activities, field trips, and individual projects. Designed for use with teachers, teachers in training, and citizens concerned with good education.

Legislative Reporter (Ohio State University; 20 min.; b&w.)

This film, in documentary style, covers the beat of an Associated Press reporter in a state capitol. An instructional film for students of journalism, it is, at the same time, a report on how the news of a democratic government in action reaches the American public.

Let's Go to Music Land (University of Oklahoma; 13 min.; b&w.)

A music education film, one in a series of 13 for television, on pre-instrument instruction. This film is intended for an audience of children between the ages of 6 and 10 years. The picture shows a teacher working with this age group.

Lion's Life, A (Pennsylvania State University; 14 min.; b&w.)

This is a public relations film for the Athletic Association, with the purpose of influencing the public to buy football season tickets. A typical "selling" job required at some time or other by most university film units.

Locks of the Sault Ste. Marie (University of Michigan; 33 min.; color.)

This film presents the operation, economics, and national significance of the "Soo" Locks, held together by the story of how a single Great Lakes freighter is taken through one of the most important waterways in the world.

Nursing—A Professional Career (Wayne State University; 14 min.; b&w.)

Produced for the College of Nursing, this film is directed to junior and senior high-school girls interested in nursing as a career. The modern nurse is pictured as a "three-dimensional" person, with both professional and broadly cultural qualifications.

Potter, The (University of Southern California; 14 min.; color.)

A graduate workshop project of the Department of Cinema, this film is intended to stimulate interest in the ceramic arts and to arouse a desire for ownership of fine pottery.

Precision System of Printing (Boston University; 3 min.; b&w.)

A multiple-camera experimental film, testing the practicability of "A and B roll" printing of entire camera originals without cutting, and a system for reducing time and cost of producing television films.

Probing for Profits (Iowa State College; 13 min.; b&w.)

Intended for extension agents, teachers, packers, farm bureau representatives, and breeders this film shows a method of measuring live swine to determine the ratio of fat to meat. Using techniques demonstrated, the hog producer and progressive farmer can select breeding stock which will produce a better meat type animal.

See How They Learn (Indiana University; 29 min.; b&w.)

This film was produced for the Indiana State Teachers Association to help counteract current criticisms that the public schools are not teaching the "Three-R's." It shows competent and professionally trained teachers in their daily classroom work and explains to a lay audience, in nonpedagogical terms, how the fundamental skills are taught.

Stage and Backstage: Space for Illusion (University of Nebraska; 30 min.; b&w.)

The third in a series of television films produced for the Educational Radio and Television Center, this picture demonstrates elements of basic stage technique.

Story of a Dam (Ohio State University; 18 min.; color.)

This is a step-by-step record of the building of the Hoover Dam Reservoir near Columbus, Ohio. Designed for students of civil engineering, this three-year project traces the development of a multimillion dollar water supply system for a modern city.

The 4-H Trail (University of California; 28 min.; color.)

Produced for the California Agricultural Extension Service, this film has as its primary audience farm children from 10 to 15 years of age. It is designed to encourage youth to affiliate with the 4-H Club movement, and for use in leader and parent education.

Tung Oil (University of Mississippi; 20 min.; color.)

Produced primarily for paint dealers, this film shows the historical background of tung oil, and the advantages and uses of this product of the state of Mississippi.

Wilderness Road, The (Virginia State Dept. of Education; 15 min.; color.)

The story of "Wilderness Road," now known as Highway 12, is told in this film. It is intended for high-school history classes to provide background for the study of the colonial period.

Wine of Morning (Bob Jones University; 120 min.; color.)

With First Century Palestine as its setting, this feature-length Biblical film presents the conservative (Evangelical) theological interpretation of the death and resurrection of Christ as revealed in the New Testament. It is in part intended to counteract the attitudes and impressions created by certain religious films intended for profit only, and has as its audience the broad Christian Protestant audience.

World of Mosaic, The (The University of California at Los Angeles; 30 min.; color.)

A history of the ancient art of the mosaic showing examples dating back 2000 years B.C., following the development of the art through the Greek, Roman, and Byzantine periods to early Mexican applications, and the renaissance of mosaic in contemporary American architecture. Narrated by former teacher of high-school English, Richard Widmark.

World of Song (Ohio State University; 13 min.; color.)

The story of 50 American students, members of the O.S.U. Symphonic Choir, who participated in the International Music Festival at Eistedffod in Llangollen, Wales, in 1955. It symbolizes their discovery that music transcends the barriers of language and nationality and unifies the world that sings.

If there is a single distinguishing characteristic in the films listed above, it would certainly be the variety of subjects portrayed. This group of 30 films ranges from a feature-length drama, to a three-minute experiment; from a screen adaptation of a story by Poe, to a purely functional, expository presentation on how to raise better hogs.

If there are trends, one of these might be the number of films showing real teachers and real students in action. "Live" classroom scenes are portrayed in *Flannelgraph, Learning Is Searching, Let's Go To Musicland,* and *See How They Learn.* The influence of the techniques of television seem to be at work here, together with a growing interest in the teaching-learning process.

The ceramic arts also seem to continue to be a popular subject, as witnessed by films like *The Potter, Clay On Your Hands,* and *The World of Mosaic.*

The documentary influence in university film production is evident in pictures like *Anger At Work, Legislative Reporter, Locks of the Sault Ste. Marie* and especially in *Bunker Hill.* But the university has yet to establish a reputation as a center for documentary film production.

A continuing problem for university film makers is how to make a palatable, imaginative, and, if possible, a thoughtful public relations film. Someday it may occur to university administrations, that the best "public relations" film may actually be the stimulating teaching film, the thoughtful documentary, the forward-reaching research film, and other motion picture presentations which, because of their originality, clarity, and devotion to the aims of higher education reflect credit on the university without proselyting or emotionalizing over the old school tie.

These, then, are some of the films—good, bad, and indifferent—produced by American universities, in 1956. They should, like all films, be looked at and not merely talked about. And in looking, one might well ask:

What should be the objective of film making in an institution of higher education, and how, in the long run, will the university-produced motion picture distinguish itself?

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